

(4)

DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

AD-A209 522

1b. RESTRICTIVE MARKINGS

DTIC FILE

3. DISTRIBUTION/AVAILABILITY OF REPORT
Approved for public release;
distribution unlimited

2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION
Research Laboratory of Electronics
Massachusetts Institute of Technology6b. OFFICE SYMBOL
(If applicable)

7a. NAME OF MONITORING ORGANIZATION

6c. ADDRESS (City, State, and ZIP Code)

77 Massachusetts Avenue
Cambridge, MA 02139

7b. ADDRESS (City, State, and ZIP Code)

8a. NAME OF FUNDING/SPONSORING
ORGANIZATION
Office of Naval Research
Department of the Navy8b. OFFICE SYMBOL
(If applicable)9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
N00014-83-K-06958c. ADDRESS (City, State, and ZIP Code)
800 North Quincy Street
Arlington, VA 22217

10. SOURCE OF FUNDING NUMBERS

PROGRAM
ELEMENT NO.PROJECT
NO.
NR 407-013TASK
NO.WORK UNIT
ACCESSION NO.

11. TITLE (Include Security Classification)

Annual Summary Report: Traps for Neutral Atoms

12. PERSONAL AUTHOR(S)

D.E. Pritchard

13a. TYPE OF REPORT
Report13b. TIME COVERED
FROM 9/1/87 TO 8/31/8814. DATE OF REPORT (Year, Month, Day)
June 7, 198915. PAGE COUNT
2 pages

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Work by D.E. Pritchard and his collaborators is summarized here.

DTIC
ELECTE
JUN 27 1989
S E D

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT

☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS21. ABSTRACT SECURITY CLASSIFICATION
UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL

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22c. OFFICE SYMBOL



PROGRESS REPORT FOR OFFICE OF NAVAL RESEARCH

TRAPS FOR NEUTRAL ATOMS

D. E. Pritchard, et al

N00014-83-K-0695

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A1	

This past year, we have concentrated on radio frequency resonance experiments on magnetically trapped neutral atoms. (We are the only group in the world which has done such experiments.) r.f. resonance of trapped atoms is valuable for at least three reasons: as a high resolution diagnostic of the atoms' individual and collective behavior, as a tool to selectively manipulate the magnetic quantum states of the trapped atoms, and potentially for ultra-high resolution spectroscopy of isolated atomic systems.

Following the successful demonstration of r.f. induced transitions on trapped neutral atoms [1], we proceeded to increase the number ($\sim 2 \times 10^{10}$) and confinement time ($\tau_{1/e} = 30$ minutes) of trapped Na atoms so that we had sufficient signal to time to perform r.f. resonance measurements as a diagnostic of the effects of doppler cooling on the atoms' energy distribution.

An r.f. resonance curve for the $|F=2, M=2\rangle$ to $|F=2, M=1\rangle$ hyperfine transition was obtained by measuring the relative peak heights of the fluorescence spectrum for the two states as a function of the frequency of the applied r.f. r.f. resonance curve for "hot" atoms (after initial loading of the trap) were much wider than that of "cool" atoms after application of longitudinal doppler cooling. We found that doppler cooling of the sample required a very weak standing wave laser beam to avoid excess heating of the transverse degree of freedom.

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